Health impacts of lead exposure from unsafe ULAB recycling

Dr. Balkrishna Korgaonkar
Director, Lead-Safe India

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Lead poisoning affects about 800 million children worldwide, and more than 400 million live in developing Asia

World

800M
children with blood lead at or above 5 µg/dL (There's no known safe level)

1.5M
deaths in 2021 linked to lead exposure

US$6T
economic loss in 2019

85%
of the world's lead goes into lead-acid batteries

Sources of lead poisoning	Paint, ULAB recycling, spices, cookware, cosmetics, metal parts molded with lead Older sources: plumbing, leaded petrol

Developing Asia

>400M children have blood lead at or above 5 µg/dL (ADB)

Children at or above 5 µg/dL in ADB developing member countries (million)

Country	Million	Country	Million
India	276.0	Nepal	6.7
Pakistan	41.1	Myanmar	4.7
Bangladesh	35.5	Vietnam	3.2
P.R. China	31.2	Cambodia	3.2
Philippines	20.0	Tajikistan	1.7
Afghanistan	19.5	Uzbekistan	1.6
Indonesia	14.7		

A global problem that affect Asia disproportionately.

Sources. UNICEF and Pure Earth (2020); ADB country table, Indonesia updated by ADB and the World Bank; IHME via WHO (2021); Larsen & Sánchez-Triana (2023). Country counts use the 5 µg/dL cut-off.

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Even low exposure causes serious life long consequences, without people knowing.

Severity	Children	Adults
1. Silent Below 10 µg/dL	**IQ falls** 3.9 points as blood lead rises from 2.4 to 10. Puberty can be delayed.	**Higher blood pressure and lower kidney filtering**
2. Symptomatic From 30 µg/dL	**Slower nerve signals and delayed growth** **Anemia.** Lead blocks hemoglobin production and shortens red cell life. Iron is present but cannot be used.	Protein in urine **Anemia**, nerve damage and lower fertility
3. Severe Above 60 µg/dL	**Colic and vomiting**	Severe abdominal cramps
4. Fatal From 70 µg/dL, or lower over years	**Convulsions, coma, death** at 70 to 100	Convulsions and coma at 100 to 120. **Cardiovascular disease** is the largest cause of lead deaths, with 70% higher risk from 6.7 µg/dL.

Vulnerable groups

Children and the unborn
Absorb more lead. The developing brain is the target. Lead crosses the placenta.

Women of childbearing age
Bone lead returns to blood in pregnancy, breastfeeding and menopause.

Workers and their families
Workers carry dust home to their families.

Nearby residents
Food, water and dust carry lead beyond the fence.

Sources. ATSDR and CDC blood lead tables; Lanphear et al. (2005, 2018); Reuben et al. (2017); Silbergeld et al. (1988); StatPearls and ATSDR on lead and anemia.

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Unsafe ULAB recycling is estimated to be responsible for 33% of lead poisoning in LMICs

Zone	How lead spreads	Evidence from Asia
At the plant	Workers carry dust home on clothes, hair, hands and shoes	In China, children with a parent working at a recycling plant had higher blood lead
Proximate locations (2-10 km)	Wind-blown dust settles on soil and homes	Vietnam. Halving the distance to a smelter raised children's blood lead by 116%. China. Lead was higher downwind.
And beyond	Water, crops, livestock and roads carry lead further	Indonesia. The main risk is food and water near sites, and learning harm appears within 3 km (ADB, ADBI). China. 44% of leafy vegetables within 1 km exceeded limits.

How lead gets in and stays

Swallowed
Hand to mouth, food and water

Inhaled
Dust and fumes near the plant

Absorbed
- 40 to 50% of lead in children
- 3 to 10% in adults

Stored
- 30-40 days of half life in blood
- Bones hold over 95% for decades.

ULAB is estimated to be responsible for 33% of lead poisoning in LMICs

Sources. Berkhout et al., ULAB sites and learning in Indonesia (ADB, ADBI); children's blood lead around a lead battery factory in China (IJERPH, 2016); toxic metals in children in a Vietnamese smelting village (UNC, 2014); CDC and ATSDR lead guidance.

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Four reasons unsafe ULAB recycling requires urgent action

Large

Unsafe battery recycling may cause about **a third of lead exposure** in low- and lower-middle-income countries (CGD).

Scrap and secondary lead have a global supply chain

Lasting

Disease itself has lifelong effects.

Even as newer types of batteries are becoming available, lead batteries are likely to stay and grow in LMICs over **next 10 years (expected to peak in 2037)**.

Growing

4-5% volume growth in LABs expected in India, even as HIC markets for LABs are degrowing.

Tractable

The problem is tractable with policy, enforcement, industry engagement and citizen action.

The world has done is it once for petrol and some countries for paint.

Sources. CGD working paper on battery recycling share. ULAB Industry interviews and conferences.

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